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To: [redacted]

September 20, 1957

Subject: Alignment of Oscillator - System III [redacted] 25X1A

Ref: Your Letter of August 19, 1957

Before getting into any discussion regarding oscillator alignment I would like to comment on some of the items in your letter.

Ref. Para. 3 - Action has been taken to place C915 in a safer location.

Ref. Para. 7 - Extremely difficult to control since the board is backed up by insulation on one side. Due to this arrangement, too much solder applied to the joint causes solder to flow under insulation. Solder fans out causing shorts between etching lines. Furthermore, additional heat on the terminal will cause the etching to pull away from the board. We are rather frustrated at plated through holes for this application. I have finally received engineering approval to have the boards on the new order eyeleted. I feel certain that this will go a long way towards solving this problem.

Ref. Para. 8 - On high frequency channels it is impossible to meet your request. Design is such that one full turn of oscillator will cause oscillator to be off frequency. The best we can do here, which we have been doing all along, is to set slugs in the middle of their tunable range. Unfortunately some slugs have a total tunable range of 1/2 to 3/4 of a slug turn. To meet your request would require a major engineering change.

Now I would like to comment on the procedure used in the field regarding oscillator alignment. The basic thought of tuning for maximum a.g.c. could result in very unstable action. With reference to the following curve you will note why.

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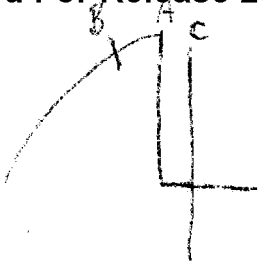

Normal Crystal Oscillator Curve

By adjusting for maximum a.g.c., you would be setting oscillator at point "A". Obviously the slightest change would cause oscillator to be out of crystal control. The proper place to adjust is at point "B", although the output is slightly lower, it is far safer for operational use. On high frequency oscillators which are series resonant, the oscillator can be adjusted for parallel resonance, point "C". Again one must insure that this doesn't occur. Frequently the area between points "B" and "C" are rather close. Caution must be used so that the oscillator is not adjusted for point "C".

Our recommendations for field alignment are as follows.

Equipment Required:

1 - System Test Set

1 - HP 410 B Meter

1 - Special Top Spring - Holes through the top to permit tuning at the oscillator slugs.

An RF signal is injected from the correct high frequency oscillator channel of the test set. The A.G.C. line of the appropriate receiver is monitored with the HP 410B. The oscillator slug is rotated until a jump is noted in the AGC reading, indicating crystal control. This should not be tuned for maximum, but be turned back a little to insure stable operation. The "Interval", and "Width" readings on the test set should be correct, per instruction manual, for that channel. With the "Read Recycle" switch operating, the "Width" counter should always display the proper count, indicating that the oscillator is stable and crystal controlled. To minimize drift problems, the unit should be turned off, allowed to cool, and then checked again to determine that the "Interval" and "Width" counter readings are correct.

The following is the factory procedure for alignment.

Equipment Required.

1 - Test Jig - for individual board type.

1 - Dual Power Supply

1 - Scope with high gain pre amp.

1 - HP 524B counter

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1 - Megasweep - Model 111A

1 - HP 608D - HP 608D VHF Sig. Gen.

1 - Special 7" Shield Can - Has holes in the side permitting access to the oscillator coils and mixer cathodes.

1 - Special Spring - As above.

1 - Counter Probe - Small loop of insulated wire inserted through hole (s) in shield can to read oscillator frequency.

1 - 100K-ohm Probe - For viewing band pass with scope at cathode of mixer.

Assuming that the 02B - C - or D Board has been "roughed in" - i.e.: RF coils aligned and oscillator working - the following procedure is followed to ensure stable oscillator operation of each channel.

With the board operating in the test jig the special shield can is placed over it and the special spring is secured. This duplicates as closely as possible actual operation in the 09 plate.

Viewing the IF output from the test jig on the scope, while the megasweep output is fed to the RF input terminal, the appropriate oscillator slug is rotated. As crystal control is reached the IF pattern on the scope will be seen to snap in. Frequency is monitored with the special counter probe, being careful not to load down the oscillator too much due to close proximity of the probe.

On the 4 low frequency oscillators, tuning normally is broad, while it is more critical on the 5 high frequency oscillators. The oscillator frequency is varied on the 4 low channels about ± 4 KC gating the oscillator on and off at the extreme to make sure that crystal control is maintained.

On the 5 high channels the same procedure is followed except that oscillator frequency is varied about ± 8 KC. It may be necessary to spread or contract the turns on the coil in the oscillator cathode circuit to achieve this range while maintaining crystal control. Then, as above, the oscillator is gated off and on manually at the extremes to check stability.

On all channels the cathode of the appropriate mixer should be viewed, with the scope and 100K-ohm probe, to ascertain that the oscillator circuits are not producing spurious signals seen as "birdies" on the bandpass pattern.

The oscillator is left at the center frequency. This ensures stability for the oscillator frequency some realignment is necessary when the board is put in the 09 plate, this is due to compacitance changes.

If any other questions arise concerning this problem, please feel free to bring them to my attention. If possible, some day it would be wise to put on a demonstration for field personnel of the two alignment methods which I have discussed. At the same time, we could answer any questions they may ask about alignment.

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